1. A system comprising:

a heat transfer system including:

a main evaporator having a core, a primary wick, and a secondary wick, and

a condenser coupled to the main evaporator by a liquid line and a vapor line,

wherein a heat transfer system loop is defined by the main evaporator, the condenser, the liquid line, and the vapor line;

a priming system configured to convert fluid into a liquid capable of wetting the primary wick of the main evaporator, the priming system including:

a priming evaporator coupled to the vapor line, and

a reservoir in fluid communication with the priming evaporator and coupled to the secondary wick of the main evaporator by a secondary fluid line.

2. The system of claim 1 wherein the reservoir is cold biased relative to an operating temperature of the heat transfer system.

3. The system of claim 2 wherein the reservoir is mounted to a heat sink thermally connected to the condenser.

4. The system of claim 1 wherein the secondary fluid line insulates the liquid line from parasitic heat input.

5. The system of claim 4 wherein the secondary fluid line is coaxial with and surrounds the liquid line.

6. The system of claim 1 wherein the priming system is configured to reduce the temperature of the heat transfer system.

7. The system of claim 1 wherein the main evaporator includes a three-port evaporator.

8. The system of claim 1 wherein the reservoir is coupled to the secondary wick of the main evaporator through a secondary condenser and a liquid line coupled to the core of the main evaporator.

9. The system of claim 1 wherein the priming system is configured to convert fluid that has a critical temperature above an operating temperature of the heat transfer system into a liquid.

10. The system of claim 9 wherein the operating temperature of the heat transfer system is a cryogenic temperature.

11. The system of claim 9 wherein the operating temperature of the heat transfer system is a sub-ambient temperature.

12. The system of claim 1 wherein the heat transfer system is used to cool an apparatus operating in an extra-terrestrial environment.

13. The system of claim 1 wherein the heat transfer system is used to cool an apparatus operating in a terrestrial environment.

14. The system of claim 1 wherein the heat transfer system is used to cool an electronic apparatus.

15. The system of claim 1 wherein the heat transfer system is used to cool an apparatus in a medical application.

16. The system of claim 1 wherein the heat transfer system is used to cool one or more of a vending machine, a computer, a component in a transportation device, a display for a computer, and an infrared sensor.

17. The system of claim 1 wherein the heat transfer system includes another reservoir operating at a temperature higher than the temperature of operation for the reservoir of the priming system to reduce a fill pressure of the system.

18. The system of claim 1 wherein the priming evaporator includes a core, a primary wick surround the core, and a secondary wick within the core.

19. The system of claim 1 wherein the main evaporator includes a bayonet tube extending through the core to guide fluid into the core.

20. A method of transporting heat, the method comprising:

priming a heat transfer system that includes a main evaporator, a vapor line, a condenser, and a liquid line connected in a loop, the priming including:

wetting a primary wick of a priming system evaporator,

applying power to the priming system evaporator,

converting fluid received from the priming system evaporator into a liquid, and

wetting the main evaporator of the heat transfer system with the liquid through the liquid line; and

reducing heat conditions within the heat transfer system, the reducing including at least one of sweeping vapor bubbles within the main evaporator into a reservoir in fluid communication with the priming evaporator or reducing parasitic heat gains on the liquid line.

21. The method of claim 20 wherein application of power to the priming evaporator enhances circulation of fluid within the heat transfer system.

22. The method of claim 21 wherein enhancing circulation of fluid within the heat transfer system includes enhancing circulation of fluid from the main evaporator, through the vapor line, through the condenser, through the liquid line, and returning into the main evaporator.

23. The method of claim 20 further comprising reducing power to the priming system evaporator once the priming system evaporator is wetted.

24. The method of claim 20 further comprising reducing power to the priming system evaporator once the priming system evaporator reaches a temperature below a critical temperature of the fluid.

25. The method of claim 20 further comprising cold biasing the reservoir relative to a temperature of the heat transfer system.

26. The method of claim 25 wherein cold biasing the reservoir includes mounting the reservoir to a heat sink that is in fluid communication with the condenser.

27. The method of claim 20 wherein wetting the primary wick of the priming system evaporator includes cold-biasing the reservoir to a temperature below the critical temperature of the fluid.

28. The method of claim 27 wherein wetting the primary wick of the priming system evaporator includes pumping liquid formed within the reservoir into the priming system evaporator using capillary pressure.

29. The method of claim 20 further comprising coupling the reservoir to a secondary fluid line in communication with a core of the main evaporator.

30. The method of claim 29 wherein sweeping vapor bubbles within the main evaporator into the reservoir includes sweeping bubbles through a secondary wick of the main evaporator, through a secondary fluid line, through a secondary condenser, and into the reservoir.

31. The method of claim 29 wherein reducing parasitic heat gains on the liquid line includes forming the secondary fluid line coaxially around the liquid line such that the secondary fluid line insulates the liquid line from parasitic heat gains.

32. The method of claim 29 wherein reducing parasitic heat gains on the liquid line includes sweeping vapor bubbles formed within the secondary fluid line due to the parasitic heat gains into the secondary condenser, where the vapor bubbles are cooled and pushed into the reservoir.

33. The method of claim 20 further comprising insulating the liquid line from parasitic heat gains.

34. The method of claim 20 further comprising operating the heat transfer system to transport heat from a heat source.

35. The method of claim 20 further comprising operating the heat transfer system at a cryogenic temperature.

36. The method of claim 20 further comprising operating the heat transfer system at a sub-ambient temperature.

37. The method of claim 20 further comprising using the heat transfer system to transport heat from an apparatus operating in an extra-terrestrial environment.

38. The method of claim 20 further comprising using the heat transfer system to transport heat from an apparatus operating in a terrestrial environment.

39. The method of claim 20 further comprising using the heat transfer system to transport heat from an electronic apparatus.

40. The method of claim 20 further comprising using the heat transfer system to transport heat from an apparatus within a medical device.

41. The method of claim 20 further comprising using the heat transfer system to transport heat from an infrared sensor.

42. The method of claim 20 further comprising using the heat transfer system to transport heat from a vending machine, a computer, a component in a transportation device, or a display device.

43. A system comprising:

a heat transfer system including:

a main evaporator having a core, a primary wick, and a secondary wick, and

a main condenser coupled to the main evaporator by a liquid line and a vapor line,

wherein a heat transfer system loop is defined by the main evaporator, the main condenser, the liquid line, and the vapor line; and

a priming system configured to convert fluid into a liquid capable of wetting the primary wick of the main evaporator, the priming system including:

a priming evaporator coupled to the vapor line,

a secondary condenser coupled to the priming evaporator and to a secondary fluid line that is in fluid communication with the core of the main evaporator, and

a reservoir in fluid communication with the priming evaporator and coupled to the secondary wick of the main evaporator by the secondary fluid line and the secondary condenser;

wherein the priming system is configured to start the heat transfer system from a supercritical state and to purge vapor from the core of the primary evaporator.

44. A method of transporting heat, the method comprising:

priming a heat transfer system that includes a main evaporator, a vapor line, a condenser, and a liquid line connected in a loop, the priming including:

cold-biasing a reservoir to condense fluid,

wetting a primary wick of a priming system evaporator including:

cold-biasing a reservoir coupled to the priming system evaporator to a temperature below the critical temperature of the fluid, and

pumping liquid formed within the reservoir into the priming system evaporator using capillary pressure,

applying power to the priming system evaporator to enhance circulation of fluid within the heat transfer system,

converting fluid received from the priming system evaporator into a liquid, and

wetting the main evaporator of the heat transfer system with the liquid through the liquid line;

supplying power to the priming system evaporator to reduce heat conditions within the heat transfer system by sweeping vapor bubbles within the main evaporator into the reservoir or reducing parasitic heat gains on the liquid line.